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HELIUM LINE 10830 Å

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TWILIGHT ENHANCEMENT OBSERVATION OF THE INFRAREDHELIUM LINE 10830 Å

(Nablyudeniye sumerechnoy vspyshki infrakrasnoy linii
Geliya 10830 Å)

Astronomicheskiy Zhurnal
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by P. V. SHCHEGLOV

The observation of the helium line 10830 Å in the night- and twilight-sky glow is of considerable interest for geophysics. The mechanism of such glow in aurorae has been studied in detail in reference [1]. The possibility of observing the twilight enhancement of the helium line 10830 Å, excited by the resonance emission lines of helium 537 and 584 Å in the extreme ultraviolet region of the solar spectrum is also indicated there.

We made an attempt to observe the line 10830 Å in twilight on February 1961, using an interference monochromator which consisted of a dielectric light filter at $\lambda = 10830 \text{ Å}$, behind which a Fabry-Perot étalon was disposed. The latter was provided with multi-layer coverings for that spectral region. The problem of contour determination of the helium line was not set up; the étalon had an instrumental contour near 2 Å, and served only as indicator of the presence of monochromatic emission; that is why the triplet structure of the line 10830 Å was not washed away. The whole system's filtration for the

helium line is sufficiently high and apparently nearly equal to that of the interferometer light-filter. The equivalent width of the band of continuous emission passing through the system did not exceed 5 \AA . Therefore, from the standpoint of its effectiveness, the utilized monochromator is superior to the usually applied for similar observations high-aperture ratio diffraction spectrographs.

The image of the interference pattern was constructed by an objective $f = 90 \text{ mm } 1:2$ on the cathode of an electron-optical converter, which served as image receiver. The etalon was so inclined during the observations as to register the center-distant interference rings.

The results of observations may be seen from Fig. 1a, 6, 8. In Fig. 1a, the twilight is still rather bright and the night-sky glow conceals the interference pattern of the line. The latter is well seen in Fig. 16 where the buildings are outlined against the background in the lower part of the picture. Finally, a total disappearance of interference fringes is noted in Fig. 18. The photographs were obtained by means of 15 minute exposures directly following one another. The absence of fringes in the third photo is of particular importance. It attests to the fact that precisely the twilight enhancement of the line 10830 \AA is registered, and not the head of the hydroxyl band in the night-sky glow, whose wavelength is near that of helium line. The disappearance of fringes in the third photo indicates also that the interference pattern of Fig. 1 cannot be explained by light diffusion of street lighting gas-discharge lamps, where helium is present.

Twilight sky glow in the line 10830 \AA was observed by us in April 1960 with the aid of the same instrumentation. It was noted that the decrease in helium line intensity is slower at those observations than in wintertime, which is explained by a greater twilight duration. Apparently, the line 10830 \AA emission may be not only observed in the twilight enhancement, but also in the night sky. Such observations may provide indications on helium distribution in the terrestrial atmosphere and on its temperature. The contour of the line 10830 \AA may be measured interferometrically to that effect. Besides, similarly to the fact that the geocoronal line H_{α} emission is an indication of solar emission in Lp , observable from the ground, the observation of line 10830 \AA will allow to keep track of Sun's activity in the lines 584 and 537 \AA .

***** E N D *****

State Astronomical Institute
in the name of
P. K. Shternberg.

Entered on
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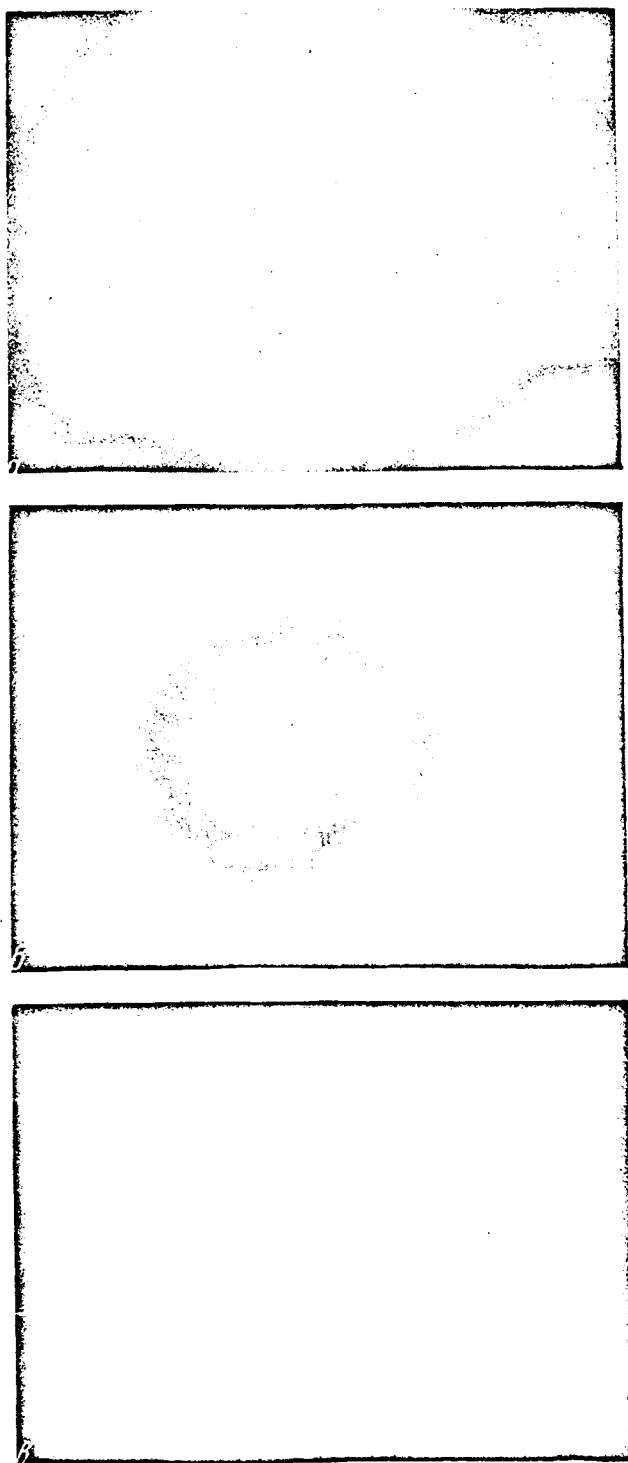


Рис. 1. Сумеречная вспышка линии 10830 Å
Fig.1. Twilight enhancement of the
line 10830 Å